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Perspective article

The geographical distribution of clinics and places with the automated external defibrillator in Taiwan

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The automated external defibrillator (AED) is a device that can automatically detect the heart rhythm and pulse of the injured patients and deliver the electric shocks to restore the heart to the normal operation. It is very easy to use, as simple as using an "idiot camera". Therefore, it is also known as the "idiot defibrillator".[1] To rescue patients

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suffering from the sudden cardiac arrest, in addition to performing cardiopulmonary resuscitation (CPR) and chest compressions for continuing blood circulation and providing oxygen to the important organs of the body as soon as possible, it is necessary to use an electric shock device for defibrillation to restore the heart to the normal heartbeat. Therefore, the CPR and the AED shock are complementary life-saving methods.[2]

Among the top ten causes of death in Taiwan, the heart disease always ranks in the top three.[2] Many deaths caused by the heart disease occur in the form of the sudden cardiac arrest, and the electric shocks can restore the heart to the normal heartbeat. In cases of the cardiac arrest due to the sudden arrhythmia, if an electric shock can be given within 1 min, the success rate of first aid can be as high as 90%. For every minute of delay in defibrillation, the survival rate will decrease by 7–10%. Moreover, beyond 12 min of delay, the survival may be as low as 2–5%.[3] Therefore, the survival of the injured patients is a race against time and death. If the AEDs are installed in the crowded public places for people to use during the rescue operations, the prehospital mortality rate of patients with such injuries and illnesses can be reduced.[2–4]

In 2013, the Taiwan government added a special provision to the Emergency Medical Services Act in Article 14-1: Public places designated by the central competent health authority shall be installed with an AED or other necessary emergency rescue equipment. The Ministry of Health and Welfare has successively announced the relevant regulations for the AED settings. Our government continues to work with all walks of life to promote the installation of the AEDs in the public places, extend the emergency rescue to the scene of the incident, and jointly create a healthy and safe living environment for our people.[2] This policy has been implemented for more than 10 years. Although the clinics (such as the dental clinics) where are also public places are not subject to this policy, some clinic facility operators have also installed the AEDs in their clinics in compliance with this policy. In this article, we attempted to explore the geographical distribution of clinics and places with the AED in Taiwan, and compare the differences in the geographical distribution between the various types of clinics and the overall places.

In this analysis, the numbers of various types of clinics (including dental clinics, Chinese medicine clinics, and western medicine clinics) with the AED and the overall places with the AED in Taiwan were obtained from the Public Place AED First Aid Information Website (https://tw-aed.mohw.gov.tw/). We queried the AED map of this website in June 2024 to obtain this information by cities/counties. In addition, the overall numbers of various types of clinics in Taiwan in 2022 were obtained from the Ministry of Health and Welfare. The results of further statistical analysis of the above-obtained data are shown in Table 1.

Based on the inquiry in June 2024, there were totally 42 clinics (including 18 dental clinics, one Chinese medicine clinic, and 23 western medicine clinics) with the AED in Taiwan, only accounting for 0.30% (42/13,941) of all places with the AED. Calculated by the numbers of different types of clinics in 2022, the proportions of the clinics with the AED were 0.26% (18/6969) in dental clinics, 0.02% (1/4131) in Chinese medicine clinics, 0.19% (23/11,998) in western medicine clinics, and 0.18% (42/23,098) in the different types of overall clinics (Table 1).

Among Chinese medicine clinics, there was only one clinic with the AED in the Kaohsiung City. The Taipei City had the largest numbers of overall clinics with the AED and overall places with the AED, accounting for 23.81% (10/42) and 17.93% (2500/13,941), respectively. However, the Taoyuan City had the largest number of dental clinics with the AED, accounting for 27.78% (5/18). The Taipei City had the largest number of western medicine clinics with the AED, accounting for 30.43% (7/23) (Table 1).

For the geographical distribution by municipalities/non-municipalities, in overall, the clinics with the AED and the places with the AED were mainly concentrated in municipalities, accounting for 76.19% (32/42) and 67.48% (9408/13,941), respectively. Moreover, the same was true for the dental clinics and western medicine clinics, accounting for 66.67% (12/18) and 82.61% (19/23), respectively. For the geographical distribution by cities/counties, in overall, the clinics with the AED and the places with the AED were mainly concentrated in the cities, accounting for 83.33% (35/42) and 72.99% (10,176/13,941), respectively. Moreover, the same was true for the dental clinics and western medicine clinics, accounting for 72.22% (13/18) and 91.30% (21/23), respectively (Table 1).

For the geographical distribution by regions, in overall, the clinics with the AED and the places with the AED were mainly concentrated in the northern region (52.38% and 45.94%), followed by the southern region (23.81% and 22.96%) and the central region (19.05% and 22.26%), respectively. However, among the dental clinics, the clinics with the AED were mainly concentrated in the northern region (55.56%), followed by the central region (27.78%) and the eastern region (11.11%), while there was no clinic with the AED in the outlying islands (0%). Moreover, among the western medicine clinics, the clinics with the AED were mainly concentrated in the northern region (52.17%), followed by the southern region (34.78%) and the central region (13.04%), while there was no clinic with the AED in the eastern region (0%) and the outlying islands (0%) (Table 1).

In 1947, Claude Beck, Professor of Surgery in the Case Western University, and a group of investigators in the University Hospitals in Cleveland, Ohio, completed the first open-heart defibrillation on a human being. Then, Beck and his colleagues would ultimately go on to develop some of the CPR practices that are still used today. In 1978, the Heart-Aid was developed. It was the first commercially available AED designed for the minimally trained lay-providers. Today's AEDs can assess the heart rhythms, coaching users in real time, and administering the automatic or semi-automatic shocks. The AEDs, now found in many public spaces, are used to save the lives of people experiencing the cardiac arrest.[5,6] Moreover, about a quarter of all deaths in the developed countries can be attributed to the cardiac arrest — an alarming number that now has a chance to fall, in not a small part, due to the AED designed to restore a healthy rhythm by shocking a heart under the ventricular fibrillation. The device is now so easy to use that even the untrained bystanders can perform this time-critical and efficient medical procedure.[1]

Table 1 Geographical distribution of clinics and places with the automated external defibrillator (AED) in Taiwan (based on the inquiry in June 2024).

Clinics and places with the AED	Different types of clinics with the AED								Places with the AED	
	Dental clinics		Chinese medicine clinics		Western medicine clinics		All clinics		All places	
Location	Number	Proportion	Number	Proportion	Number	Proportion	Number	Proportion	Number	Proportion
A. Geographical distribution of clinics and places with the AED by city and county administrative districts[a]										
New Taipei City	1	5.56%	0	0	0	0	1	2.38%	1601	11.48%
Taipei City	3	16.67%	0	0	7	30.43%	10	23.81%	2500	17.93%
Taoyuan City	5	27.78%	0	0	4	17.39%	9	21.43%	1440	10.33%
Taichung City	2	11.11%	0	0	2	8.70%	4	9.52%	1710	12.27%
Tainan City	0	0	0	0	3	13.04%	3	7.14%	820	5.88%
Kaohsiung City	1	5.56%	1	100%	3	13.04%	5	11.90%	1337	9.59%
Keelung City	0	0	0	0	0	0	0	0	227	1.63%
Hsinchu City	1	5.56%	0	0	1	4.35%	2	4.76%	271	1.94%
Chiayi City	0	0	0	0	1	4.35%	1	2.38%	270	1.94%
Hsinchu County	0	0	0	0	0	0	0	0	365	2.62%
Miaoli County	1	5.56%	0	0	0	0	1	2.38%	303	2.17%
Changhua County	2	11.11%	0	0	1	4.35%	3	7.14%	569	4.08%
Nantou County	0	0	0	0	0	0	0	0	228	1.64%
Yunlin County	0	0	0	0	0	0	0	0	293	2.10%
Chiayi County	0	0	0	0	0	0	0	0	301	2.16%
Pingtung County	0	0	0	0	1	4.35%	1	2.38%	473	3.39%
Yilan County	2	11.11%	0	0	0	0	2	4.76%	335	2.40%
Hualien County	0	0	0	0	0	0	0	0	327	2.35%
Taitung County	0	0	0	0	0	0	0	0	262	1.88%
Penghu County	0	0	0	0	0	0	0	0	155	1.11%
Kinmen County	0	0	0	0	0	0	0	0	122	0.88%
Lienchiang County	0	0	0	0	0	0	0	0	32	0.23%
B. Geographical distribution of clinics and places with the AED by municipality and non-municipality groups										
Municipality	12	66.67%	1	100%	19	82.61%	32	76.19%	9408	67.48%
Non-municipality	6	33.33%	0	0	4	17.39%	10	23.81%	4533	32.52%
C. Geographical distribution of clinics and places with the AED by city and county groups										
City	13	72.22%	1	100%	21	91.30%	35	83.33%	10,176	72.99%
County	5	27.78%	0	0	2	8.70%	7	16.67%	3765	27.01%
D. Geographical distribution of clinics and places with the AED by regions[b]										
Northern	10	55.56%	0	0	12	52.17%	22	52.38%	6404	45.94%
Central	5	27.78%	0	0	3	13.04%	8	19.05%	3103	22.26%
Southern	1	5.56%	1	100%	8	34.78%	10	23.81%	3201	22.96%
Eastern	2	11.11%	0	0	0	0	2	4.76%	924	6.63%
Outlying islands	0	0	0	0	0	0	0	0	309	2.22%
E. Clinics and places with the AED in overall[c]										
Overall	18	42.86%	1	2.38%	23	54.76%	42	100%	13,941	100%
F. Different types of clinics in Taiwan in 2022										
Number	6969	30.17%	4131	17.88%	11,998	51.94%	23,098	100%	—	—
Proportion of clinics with AED[d]	0.26%	—	0.02%	—	0.19%	—	0.18%	—	—	—

[a] The first 6 cities are municipalities directly under the central government, and the others are non-municipalities.

[b] In this analysis, the whole area of Taiwan was divided into five regions: the northern, central, southern, and eastern regions and offshore islands. The northern region (n = 6) included Keelung City, New Taipei City, Taipei City, Taoyuan City, Hsinchu City, and Hsinchu County. The central region (n = 5) included Miaoli County, Taichung City, Changhua County, Nantou County, and Yunlin County. The southern region (n = 5) included Chiayi City, Chiayi County, Tainan City, Kaohsiung City, and Pingtung County. The eastern region (n = 3) included Yilan County, Hualien County, and Taitung County. The offshore islands (n = 3) included Penghu County, Kinmen County, and Lienchiang County.

[c] This proportion referred to the proportion of the dental clinics, Chinese medicine clinics, and western medicine clinics in the number of all clinics.

[d] This proportion referred to the proportion of the various types of clinics with the AED in the number of all clinics in its category.

In Taiwan, the AEDs are installed in more and more public places. This is because our laws and regulations stipulate that large public places and some specific places must have the AEDs. The clinics are not legally required to install the AEDs, but we have found that some clinic facility operators proactively install the AEDs in their clinics. Although the current proportion of clinics with the AED among all different types of clinics is still low, we are pleased that the clinic facility operators begin to care about the importance of this issue. Comparing the availability of the AEDs in the various types of clinics, 1.9 of every 1000 western medicine clinics have the AEDs, while 2.6 of every 1000 dental clinics have the AEDs. There are some differences between the western medicine and dental clinics in terms of the geographical distribution of the clinics with the AED. However, the common features were that these clinics with the AED were mainly concentrated in the municipalities, the cities, and the northern region with the serious urban-rural gaps. The same features occurred among all places with the AED. Considering that the remote areas usually have the characteristics of vast land, sparse population, and lack of the medical resources, thereby there is a greater need for widespread installation of the AEDs in these remote areas.[7]

The widespread installation of the AEDs is a manifestation of the progress of society's overall health literacy, while the role of the good health literacy is related to the good health outcomes.[8] In addition to the support of infrastructure and medical health progress, the improvement of public health literacy and awareness and the attention of facility operators are also the important keys to the success of promoting the AED installation policy. The world's first successful human cardiac defibrillation nearly 80 years ago was a landmark event that defined the future of the cardiovascular medicine. The advent of the AED and the promotion of the AED health strategies internationally have ushered in a new era of the advanced cardiac life support.[5]

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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